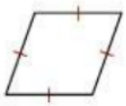
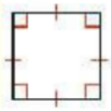
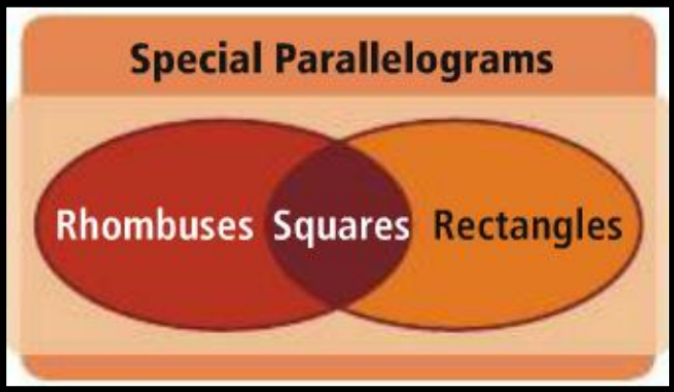
Chapter 6: Polygons

Section 4-5: Rhombuses, rectangles and squares

Key Learning Objective: special parallelograms

Definition	Diagram
A **rhombus** is a parallelogram with four congruent sides.	
A **rectangle** is a parallelogram with four right angles.	
A **square** is a parallelogram with four congruent sides and four right angles.	

Visualization: venn diagram



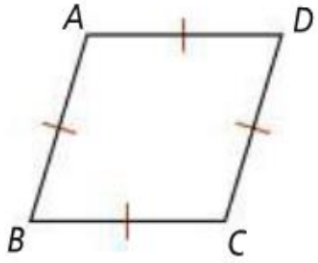
Real-life example: rectangle?

- Is parallelogram ABCD a rhombus, a rectangle or a square?
- Apply the properties of a parallel: opposite angles are congruent, so angle D must be 90 degrees.

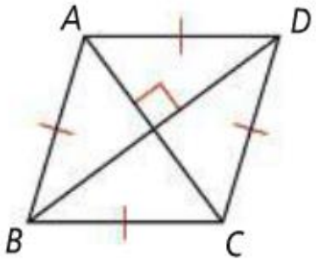
- Check the properties of a rhombus, rectangle and square. Which one matches that information?
- Rectangle!
- What is parallelogram EFGH?

Theorem 6-13

If . . .
ABCD is a rhombus



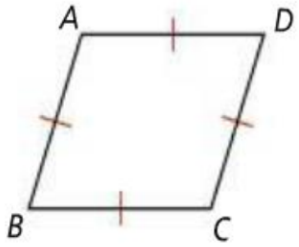
Then . . .
$\overline{AC} \perp \overline{BD}$



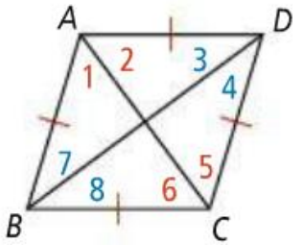
- If a parallelogram is a rhombus, then it's diagonals are perpendicular.

Theorem 6-14

If . . .
ABCD is a rhombus



Then . . .

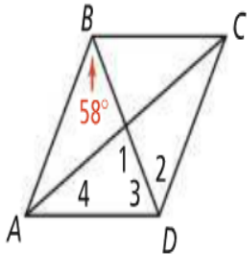


$\angle 1 \cong \angle 2$
$\angle 3 \cong \angle 4$
$\angle 5 \cong \angle 6$
$\angle 7 \cong \angle 8$

- If a parallelogram is a rhombus then each diagonal bisects a pair of opposite angles.

Finding missing angle measures

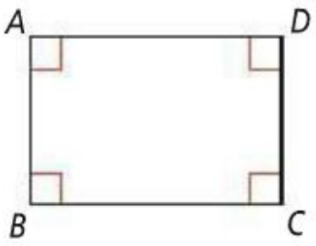
What are the measures of the numbered angles in rhombus *ABCD*?



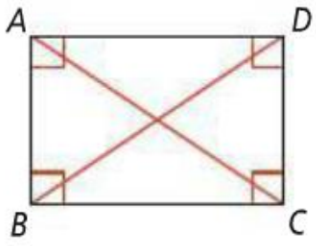
$m\angle 1 = 90$	The diagonals of a rhombus are $\perp$.
$m\angle 2 = 58$	Alternate Interior Angles Theorem
$m\angle 3 = 58$	Each diagonal of a rhombus bisects a pair of opposite angles.
$m\angle 1 + m\angle 3 + m\angle 4 = 180$	Triangle Angle-Sum Theorem
$90 + 58 + m\angle 4 = 180$	Substitute.
$148 + m\angle 4 = 180$	Simplify.
$m\angle 4 = 32$	Subtract 148 from each side.

Theorem 6-15

If . . .
ABCD is a rectangle



Then . . .
$\overline{AC} \cong \overline{BD}$

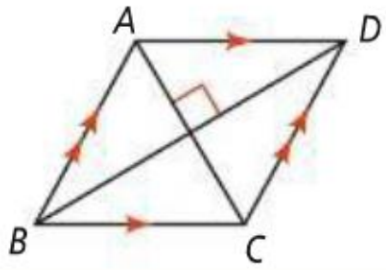


- If a parallelogram is a rectangle then it's diagonals are congruent.

Theorem 6-16

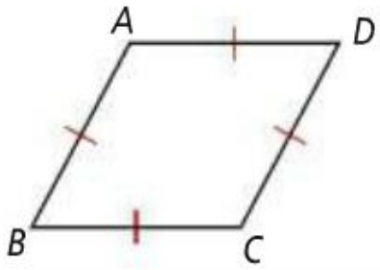
If . . .

$ABCD$ is a $\square$ and $\overline{AC} \perp \overline{BD}$



Then . . .

$ABCD$ is a rhombus

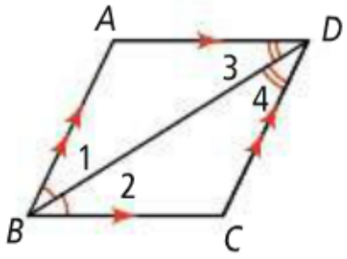


- If the diagonals of a parallelogram are perpendicular then the parallelogram is a rhombus.

Theorem 6-17

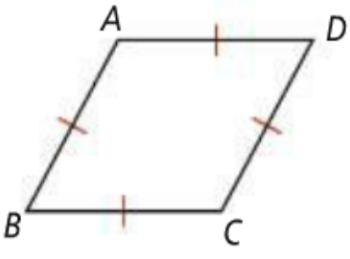
If . . .

$ABCD$ is a $\square$, $\angle 1 \cong \angle 2$, and $\angle 3 \cong \angle 4$



Then . . .

$ABCD$ is a rhombus

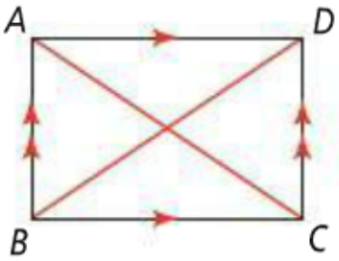


- If one diagonal of a parallelogram bisects a pair of opposite angles then the parallelogram is a rhombus.

Theorem 6-18

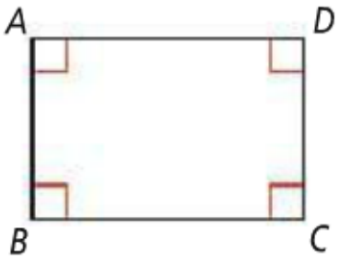
If . . .

$ABCD$ is a $\square$, and $\overline{AC} \cong \overline{BD}$



Then . . .

$ABCD$ is a rectangle



- If the diagonals of a parallelogram are congruent then the parallelogram is a rectangle.